

The best known (n, r) -arcs in $\text{PG}(2, 13)$

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After the absurd death of Axel Kohnert in 2013 several hardware errors on the site of the University of Bayreuth have occurred and the database for (n, r) -arcs is no longer available. For that reason we decided to reconstruct the database.

Lower and upper bounds on $m_r(2, 13)$ [1]

$r = 2$	$r = 3$	$r = 4$	$r = 5$	$r = 6$	$r = 7$
14	23	38–40	49–53	64–66	79
$r = 8$	$r = 9$	$r = 10$	$r = 11$	$r = 12$	
92	105	118–119	132–133	145–147	

1. A (23,3)-arc ([2])

The points in the arc are

$(0, 0, 1)$, $(0, 1, 0)$, $(1, 0, 0)$, $(1, 1, 7)$, $(1, 8, 6)$, $(1, 12, 7)$, $(1, 5, 6)$, $(1, 1, 12)$, $(1, 8, 1)$, $(1, 12, 12)$,
 $(1, 5, 1)$, $(1, 10, 4)$, $(1, 2, 9)$, $(1, 3, 4)$, $(1, 11, 9)$, $(1, 10, 3)$, $(1, 2, 10)$, $(1, 3, 3)$, $(1, 11, 10)$, $(1, 4, 11)$,
 $(1, 6, 2)$, $(1, 9, 11)$, $(1, 7, 2)$

The secant distribution of the arc is $\tau = (44, 26, 43, 70, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0)$

The arc is found by prescribing the group generated by

$$\left\langle \begin{pmatrix} 12 & 0 & 0 \\ 0 & 12 & 0 \\ 0 & 0 & 12 \end{pmatrix}, \begin{pmatrix} 12 & 0 & 0 \\ 0 & 5 & 0 \\ 0 & 0 & 1 \end{pmatrix}, \begin{pmatrix} 12 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 12 \end{pmatrix} \right\rangle.$$

The order of the group is 8.

2. A (38,4)-arc ([2])

The points in the arc are

$(0, 0, 1)$, $(0, 1, 0)$, $(1, 1, 1)$, $(1, 9, 3)$, $(1, 12, 12)$, $(1, 3, 9)$, $(1, 10, 4)$, $(1, 4, 10)$, $(1, 1, 8)$, $(1, 9, 11)$,
 $(1, 8, 1)$, $(1, 5, 12)$, $(1, 3, 7)$, $(1, 11, 9)$, $(1, 2, 4)$, $(1, 7, 3)$, $(1, 12, 5)$, $(1, 6, 10)$, $(1, 4, 2)$, $(1, 10, 6)$,
 $(1, 1, 9)$, $(1, 9, 1)$, $(1, 4, 12)$, $(1, 3, 3)$, $(1, 12, 4)$, $(1, 10, 10)$, $(1, 11, 6)$, $(1, 8, 5)$, $(1, 6, 11)$, $(1, 7, 2)$,
 $(1, 5, 8)$, $(1, 2, 7)$, $(1, 11, 2)$, $(1, 8, 6)$, $(1, 2, 11)$, $(1, 7, 5)$, $(1, 6, 8)$, $(1, 5, 7)$

The secant distribution of the arc is $\tau = (24, 14, 19, 24, 102, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0)$

The arc is found by prescribing the group generated by

$$\left\langle \begin{pmatrix} 1 & 0 & 0 \\ 0 & 9 & 0 \\ 0 & 0 & 3 \end{pmatrix}, \begin{pmatrix} 12 & 0 & 0 \\ 0 & 0 & 12 \\ 0 & 12 & 0 \end{pmatrix}, \begin{pmatrix} 12 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{pmatrix} \right\rangle.$$

The order of the group is 12.

3. A (49,5)-arc ([2])

The points in the arc are

(0, 1, 5), (0, 1, 6), (0, 1, 7), (0, 1, 9), (0, 1, 12), (1, 0, 1), (1, 0, 8), (1, 0, 12), (1, 0, 5), (1, 1, 0), (1, 8, 0), (1, 12, 0), (1, 5, 0), (1, 1, 1), (1, 8, 8), (1, 12, 12), (1, 5, 5), (1, 1, 3), (1, 8, 11), (1, 12, 10), (1, 5, 2), (1, 1, 4), (1, 8, 6), (1, 12, 9), (1, 5, 7), (1, 1, 12), (1, 8, 5), (1, 12, 1), (1, 5, 8), (1, 10, 5), (1, 2, 1), (1, 3, 8), (1, 11, 12), (1, 10, 7), (1, 2, 4), (1, 3, 6), (1, 11, 9), (1, 10, 9), (1, 2, 7), (1, 3, 4), (1, 11, 6), (1, 10, 6), (1, 2, 9), (1, 3, 7), (1, 11, 4), (1, 4, 7), (1, 6, 4), (1, 9, 6), (1, 7, 9)

The secant distribution of the arc is $\tau = (5, 34, 0, 8, 52, 84, 0, 0, 0, 0, 0, 0, 0, 0, 0)$

The arc is found by prescribing the group generated by

$$\left\langle \begin{pmatrix} 4 & 0 & 0 \\ 0 & 6 & 0 \\ 0 & 0 & 6 \end{pmatrix} \right\rangle.$$

The order of the group is 12.

4. A (64,6)-arc ([2])

The points in the arc are

(1, 0, 0), (1, 0, 1), (1, 8, 10), (1, 2, 8), (1, 12, 5), (1, 1, 3), (1, 11, 12), (1, 5, 0), (1, 0, 3), (1, 11, 4), (1, 6, 11), (1, 10, 2), (1, 3, 9), (1, 7, 10), (1, 2, 0), (1, 0, 10), (1, 2, 9), (1, 7, 2), (1, 3, 11), (1, 10, 4), (1, 6, 3), (1, 11, 0), (1, 0, 12), (1, 5, 3), (1, 11, 5), (1, 1, 8), (1, 12, 10), (1, 2, 1), (1, 8, 0), (1, 1, 2), (1, 3, 2), (1, 3, 5), (1, 1, 9), (1, 7, 7), (1, 4, 9), (1, 7, 5), (1, 1, 12), (1, 5, 11), (1, 10, 7), (1, 4, 7), (1, 4, 11), (1, 10, 12), (1, 5, 5), (1, 2, 10), (1, 2, 12), (1, 5, 6), (1, 9, 9), (1, 7, 6), (1, 9, 12), (1, 5, 10), (1, 12, 1), (1, 8, 2), (1, 3, 6), (1, 9, 6), (1, 9, 2), (1, 3, 1), (1, 8, 8), (1, 11, 1), (1, 8, 7), (1, 4, 4), (1, 6, 7), (1, 4, 1), (1, 8, 3), (1, 11, 3)

The secant distribution of the arc is $\tau = (15, 0, 0, 14, 14, 42, 98, 0, 0, 0, 0, 0, 0, 0, 0)$

The arc is found by prescribing the group generated by

$$\left\langle \begin{pmatrix} 9 & 0 & 0 \\ 0 & 0 & 7 \\ 0 & 7 & 12 \end{pmatrix} \right\rangle.$$

The order of the group is 21.

5. A (79,7)-arc (Barlotti's construction, [3])

The points in the arc are

(0, 1, 0), (1, 1, 1), (1, 1, 2), (1, 1, 6), (1, 1, 7), (1, 1, 11), (1, 1, 12), (1, 2, 0), (1, 2, 2), (1, 2, 3), (1, 2, 4), (1, 2, 9), (1, 2, 10), (1, 2, 11), (1, 3, 2), (1, 3, 4), (1, 3, 5), (1, 3, 8), (1, 3, 9), (1, 3, 11), (1, 4, 1), (1, 4, 2), (1, 4, 4), (1, 4, 9), (1, 4, 11), (1, 4, 12), (1, 5, 0), (1, 5, 1), (1, 5, 4), (1, 5, 6), (1, 5, 7), (1, 5, 9), (1, 5, 12), (1, 6, 0), (1, 6, 1), (1, 6, 3), (1, 6, 5), (1, 6, 8), (1, 6, 10), (1, 6, 12), (1, 7, 0), (1, 7, 1), (1, 7, 2), (1, 7, 5),

(1, 7, 8), (1, 7, 11), (1, 7, 12), (1, 8, 0), (1, 8, 4), (1, 8, 5), (1, 8, 6), (1, 8, 7), (1, 8, 8), (1, 8, 9), (1, 9, 3), (1, 9, 5), (1, 9, 6), (1, 9, 7), (1, 9, 8), (1, 9, 10), (1, 10, 1), (1, 10, 3), (1, 10, 6), (1, 10, 7), (1, 10, 10), (1, 10, 12), (1, 11, 0), (1, 11, 2), (1, 11, 3), (1, 11, 6), (1, 11, 7), (1, 11, 10), (1, 11, 11), (1, 12, 3), (1, 12, 4), (1, 12, 5), (1, 12, 8), (1, 12, 9), (1, 12, 10)

The secant distribution of the arc is $\tau = (13, 1, 0, 0, 0, 0, 78, 91, 0, 0, 0, 0, 0, 0, 0)$

6. A (92,8)-arc (Barlotti's construction, [3])

The points in the arc are

(0, 1, 0), (1, 0, 0), (1, 1, 1), (1, 1, 2), (1, 1, 5), (1, 1, 6), (1, 1, 7), (1, 1, 8), (1, 1, 11), (1, 1, 12), (1, 2, 0), (1, 2, 2), (1, 2, 3), (1, 2, 4), (1, 2, 9), (1, 2, 10), (1, 2, 11), (1, 3, 2), (1, 3, 4), (1, 3, 5), (1, 3, 6), (1, 3, 7), (1, 3, 8), (1, 3, 9), (1, 3, 11), (1, 4, 1), (1, 4, 2), (1, 4, 3), (1, 4, 4), (1, 4, 9), (1, 4, 10), (1, 4, 11), (1, 4, 12), (1, 5, 0), (1, 5, 1), (1, 5, 4), (1, 5, 6), (1, 5, 7), (1, 5, 9), (1, 5, 12), (1, 6, 0), (1, 6, 1), (1, 6, 3), (1, 6, 5), (1, 6, 8), (1, 6, 10), (1, 6, 12), (1, 7, 0), (1, 7, 1), (1, 7, 2), (1, 7, 5), (1, 7, 8), (1, 7, 11), (1, 7, 12), (1, 8, 0), (1, 8, 4), (1, 8, 5), (1, 8, 6), (1, 8, 7), (1, 8, 8), (1, 8, 9), (1, 9, 2), (1, 9, 3), (1, 9, 5), (1, 9, 6), (1, 9, 7), (1, 9, 8), (1, 9, 10), (1, 9, 11), (1, 10, 1), (1, 10, 3), (1, 10, 4), (1, 10, 6), (1, 10, 7), (1, 10, 9), (1, 10, 10), (1, 10, 12), (1, 11, 0), (1, 11, 2), (1, 11, 3), (1, 11, 6), (1, 11, 7), (1, 11, 10), (1, 11, 11), (1, 12, 1), (1, 12, 3), (1, 12, 4), (1, 12, 5), (1, 12, 8), (1, 12, 9), (1, 12, 10), (1, 12, 12)

The secant distribution of the arc is $\tau = (0, 14, 0, 0, 0, 0, 0, 78, 91, 0, 0, 0, 0, 0, 0)$

7. A (105,9)-arc ([2])

The points in the arc are

(0, 1, 2), (1, 2, 0), (1, 7, 0), (1, 0, 7), (0, 1, 7), (1, 0, 2), (0, 1, 3), (1, 3, 0), (1, 9, 0), (1, 0, 9), (0, 1, 9), (1, 0, 3), (0, 1, 5), (1, 5, 0), (1, 8, 0), (1, 0, 8), (0, 1, 8), (1, 0, 5), (0, 1, 11), (1, 11, 0), (1, 6, 0), (1, 0, 6), (0, 1, 6), (1, 0, 11), (1, 1, 3), (1, 3, 1), (1, 9, 9), (1, 1, 4), (1, 4, 1), (1, 10, 10), (1, 1, 5), (1, 5, 1), (1, 8, 8), (1, 1, 6), (1, 6, 1), (1, 11, 11), (1, 1, 7), (1, 7, 1), (1, 2, 2), (1, 1, 8), (1, 8, 1), (1, 5, 5), (1, 1, 9), (1, 9, 1), (1, 3, 3), (1, 1, 10), (1, 10, 1), (1, 4, 4), (1, 1, 11), (1, 11, 1), (1, 6, 6), (1, 10, 7), (1, 2, 4), (1, 7, 2), (1, 2, 7), (1, 7, 10), (1, 4, 2), (1, 11, 9), (1, 2, 6), (1, 7, 3), (1, 3, 7), (1, 9, 11), (1, 6, 2), (1, 10, 5), (1, 7, 4), (1, 2, 8), (1, 8, 2), (1, 5, 10), (1, 4, 7), (1, 11, 7), (1, 3, 6), (1, 9, 2), (1, 2, 9), (1, 7, 11), (1, 6, 3), (1, 10, 2), (1, 8, 4), (1, 5, 7), (1, 7, 5), (1, 2, 10), (1, 4, 8), (1, 11, 8), (1, 9, 6), (1, 3, 5), (1, 5, 3), (1, 8, 11), (1, 6, 9), (1, 10, 8), (1, 6, 4), (1, 11, 5), (1, 5, 11), (1, 8, 10), (1, 4, 6), (1, 10, 6), (1, 11, 4), (1, 6, 11), (1, 11, 6), (1, 6, 10), (1, 4, 11), (1, 12, 5), (1, 8, 12), (1, 5, 8), (1, 8, 5), (1, 5, 12), (1, 12, 8)

The secant distribution of the arc is $\tau = (5, 0, 3, 0, 0, 0, 6, 27, 39, 103, 0, 0, 0, 0, 0)$

The arc is found by prescribing the group generated by

$$\left\langle \begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{pmatrix}, \begin{pmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{pmatrix} \right\rangle.$$

The order of the group is 6.

8. A (118,10)-arc ([2])

The points in the arc are

(0, 1, 1), (1, 1, 0), (1, 0, 1), (1, 12, 0), (1, 0, 12), (0, 1, 12), (0, 1, 11), (1, 11, 0), (1, 0, 6), (1, 2, 0), (1, 0, 7), (0, 1, 2), (0, 1, 4), (1, 4, 0), (1, 0, 10), (1, 9, 0), (1, 0, 3), (0, 1, 9), (0, 1, 5), (1, 5, 0), (1, 0, 8), (1, 8, 0), (1, 0, 5), (0, 1, 8), (0, 1, 6), (1, 6, 0), (1, 0, 11), (1, 7, 0), (1, 0, 2), (0, 1, 7), (1, 1, 11), (1, 11, 1), (1, 12, 2), (1, 6, 6), (1, 2, 12), (1, 11, 12), (1, 7, 7), (1, 6, 7), (1, 7, 6), (1, 2, 1), (1, 1, 2), (1, 12, 11), (1, 1, 10), (1, 10, 1), (1, 12, 3), (1, 4, 4), (1, 3, 12), (1, 10, 12), (1, 9, 9), (1, 4, 9), (1, 9, 4), (1, 3, 1),

(1, 1, 3), (1, 12, 10), (1, 1, 4), (1, 4, 1), (1, 12, 9), (1, 10, 10), (1, 9, 12), (1, 4, 12), (1, 3, 3), (1, 10, 3), (1, 3, 10), (1, 9, 1), (1, 1, 9), (1, 12, 4), (1, 10, 6), (1, 11, 4), (1, 3, 7), (1, 11, 6), (1, 2, 9), (1, 11, 9), (1, 2, 7), (1, 11, 7), (1, 2, 6), (1, 2, 4), (1, 10, 7), (1, 3, 6), (1, 11, 5), (1, 4, 6), (1, 2, 8), (1, 8, 10), (1, 9, 7), (1, 4, 7), (1, 5, 3), (1, 8, 3), (1, 5, 10), (1, 9, 6), (1, 11, 8), (1, 2, 5), (1, 10, 11), (1, 5, 4), (1, 3, 2), (1, 6, 8), (1, 8, 9), (1, 5, 9), (1, 7, 5), (1, 6, 5), (1, 7, 8), (1, 8, 4), (1, 10, 2), (1, 3, 11), (1, 10, 4), (1, 3, 4), (1, 3, 9), (1, 10, 9), (1, 4, 11), (1, 6, 10), (1, 9, 2), (1, 6, 11), (1, 7, 3), (1, 6, 3), (1, 7, 2), (1, 6, 2), (1, 7, 11), (1, 7, 10), (1, 4, 2), (1, 9, 11)

The secant distribution of the arc is $\tau = (4, 0, 0, 0, 0, 6, 0, 6, 12, 66, 89, 0, 0, 0, 0)$

The arc is found by prescribing the group generated by

$$\left\langle \begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{pmatrix}, \begin{pmatrix} 5 & 0 & 0 \\ 0 & 8 & 0 \\ 0 & 0 & 8 \end{pmatrix} \right\rangle.$$

The order of the group is 48.

9. A (132,11)-arc ([2])

The points in the arc are

(0, 0, 1), (0, 1, 0), (1, 0, 0), (0, 1, 1), (1, 1, 0), (1, 0, 1), (0, 1, 2), (1, 2, 0), (1, 0, 2), (1, 0, 7), (1, 7, 0), (0, 1, 7), (0, 1, 3), (1, 3, 0), (1, 0, 3), (1, 0, 9), (1, 9, 0), (0, 1, 9), (0, 1, 10), (1, 10, 0), (1, 0, 10), (1, 0, 4), (1, 4, 0), (0, 1, 4), (0, 1, 5), (1, 5, 0), (1, 0, 5), (1, 0, 8), (1, 8, 0), (0, 1, 8), (1, 1, 1), (1, 1, 2), (1, 2, 1), (1, 7, 7), (1, 1, 4), (1, 4, 1), (1, 10, 10), (1, 1, 9), (1, 9, 1), (1, 3, 3), (1, 1, 11), (1, 11, 1), (1, 6, 6), (1, 1, 12), (1, 12, 1), (1, 12, 12), (1, 2, 3), (1, 8, 7), (1, 7, 8), (1, 9, 5), (1, 5, 9), (1, 3, 2), (1, 10, 7), (1, 2, 4), (1, 4, 2), (1, 2, 7), (1, 7, 2), (1, 7, 10), (1, 2, 5), (1, 9, 7), (1, 7, 9), (1, 8, 3), (1, 3, 8), (1, 5, 2), (1, 11, 9), (1, 2, 6), (1, 6, 2), (1, 3, 7), (1, 7, 3), (1, 9, 11), (1, 10, 2), (1, 8, 4), (1, 4, 8), (1, 7, 5), (1, 5, 7), (1, 2, 10), (1, 11, 2), (1, 12, 6), (1, 6, 12), (1, 7, 12), (1, 12, 7), (1, 2, 11), (1, 11, 12), (1, 7, 6), (1, 6, 7), (1, 12, 2), (1, 2, 12), (1, 12, 11), (1, 10, 4), (1, 3, 4), (1, 4, 3), (1, 10, 9), (1, 9, 10), (1, 4, 10), (1, 11, 8), (1, 9, 6), (1, 6, 9), (1, 5, 3), (1, 3, 5), (1, 8, 11), (1, 3, 9), (1, 9, 3), (1, 11, 3), (1, 5, 6), (1, 6, 5), (1, 9, 8), (1, 8, 9), (1, 3, 11), (1, 10, 12), (1, 9, 4), (1, 4, 9), (1, 12, 3), (1, 3, 12), (1, 12, 10), (1, 10, 8), (1, 6, 4), (1, 4, 6), (1, 5, 11), (1, 11, 5), (1, 8, 10), (1, 10, 6), (1, 11, 4), (1, 4, 11), (1, 11, 6), (1, 6, 11), (1, 6, 10), (1, 12, 5), (1, 8, 12), (1, 12, 8), (1, 8, 5), (1, 5, 8), (1, 5, 12)

The secant distribution of the arc is $\tau = (0, 0, 0, 0, 0, 9, 6, 0, 9, 9, 36, 114, 0, 0, 0)$

The arc is found by prescribing the group generated by

$$\left\langle \begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{pmatrix}, \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix} \right\rangle.$$

The order of the group is 6.

10. A (145,12)-arc ([2])

The points in the arc are

(0, 0, 1), (0, 1, 0), (1, 0, 0), (0, 1, 11), (1, 11, 0), (1, 0, 6), (1, 2, 0), (1, 0, 7), (0, 1, 2), (0, 1, 10), (1, 10, 0), (1, 0, 4), (1, 3, 0), (1, 0, 9), (0, 1, 3), (0, 1, 4), (1, 4, 0), (1, 0, 10), (1, 9, 0), (1, 0, 3), (0, 1, 9), (0, 1, 5), (1, 5, 0), (1, 0, 8), (1, 8, 0), (1, 0, 5), (0, 1, 8), (0, 1, 6), (1, 6, 0), (1, 0, 11), (1, 7, 0), (1, 0, 2), (0, 1, 7), (1, 1, 10), (1, 10, 1), (1, 12, 3), (1, 4, 4), (1, 3, 12), (1, 10, 12), (1, 9, 9), (1, 4, 9), (1, 9, 4), (1, 3, 1), (1, 1, 3), (1, 12, 10), (1, 1, 4), (1, 4, 1), (1, 12, 9), (1, 10, 10), (1, 9, 12), (1, 4, 12), (1, 3, 3), (1, 10, 3), (1, 3, 10), (1, 9, 1), (1, 1, 9), (1, 12, 4), (1, 1, 5), (1, 5, 1), (1, 12, 8), (1, 8, 8), (1, 8, 12), (1, 5, 12), (1, 5, 5), (1, 8, 5), (1, 5, 8), (1, 8, 1), (1, 1, 8), (1, 12, 5), (1, 1, 6), (1, 6, 1), (1, 12, 7), (1, 11, 11),

(1, 7, 12), (1, 6, 12), (1, 2, 2), (1, 11, 2), (1, 2, 11), (1, 7, 1), (1, 1, 7), (1, 12, 6), (1, 10, 6), (1, 11, 4),
 (1, 3, 7), (1, 11, 6), (1, 2, 9), (1, 11, 9), (1, 2, 7), (1, 11, 7), (1, 2, 6), (1, 2, 4), (1, 10, 7), (1, 3, 6),
 (1, 11, 5), (1, 4, 6), (1, 2, 8), (1, 8, 10), (1, 9, 7), (1, 4, 7), (1, 5, 3), (1, 8, 3), (1, 5, 10), (1, 9, 6), (1, 11, 8),
 (1, 2, 5), (1, 10, 11), (1, 5, 4), (1, 3, 2), (1, 6, 8), (1, 8, 9), (1, 5, 9), (1, 7, 5), (1, 6, 5), (1, 7, 8), (1, 8, 4),
 (1, 10, 2), (1, 3, 11), (1, 10, 5), (1, 7, 4), (1, 3, 8), (1, 8, 2), (1, 6, 9), (1, 7, 9), (1, 5, 11), (1, 8, 11),
 (1, 5, 2), (1, 6, 4), (1, 10, 8), (1, 3, 5), (1, 4, 11), (1, 6, 10), (1, 9, 2), (1, 6, 11), (1, 7, 3), (1, 6, 3),
 (1, 7, 2), (1, 6, 2), (1, 7, 11), (1, 7, 10), (1, 4, 2), (1, 9, 11), (1, 4, 10), (1, 9, 10), (1, 9, 3), (1, 4, 3)

The secant distribution of the arc is $\tau = (0, 0, 0, 0, 4, 0, 0, 0, 0, 18, 22, 36, 103, 0, 0)$

The arc is found by prescribing the group generated by

$$\left\langle \begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{pmatrix}, \begin{pmatrix} 5 & 0 & 0 \\ 0 & 8 & 0 \\ 0 & 0 & 8 \end{pmatrix} \right\rangle.$$

The order of the group is 48.

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